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7. Appendix D: Infrastructure & Environment

Introduction

The following sections encompass a discussion of the existing physical conditions of the Southwest Waterfront. Conditions described in these sections include an array of environmental resources, infrastructure, and waterfront elements. The following section will analyze the potential impacts to the environmental resources, infrastructure and waterfront elements as a result of the proposed Southwest Waterfront Development Plan.

Assessment of Existing Conditions

Environmental Sources

The Southwest Waterfront is part of the urban environment of the District of Columbia. There are a number of environmental issues that may have relevance to future redevelopment in the Southwest Waterfront, and these are considered in this section. The Southwest Waterfront consultant team did a preliminary evaluation of the following to inform the planning process: air quality, geology, soils, wildlife resources, water quality and aquatic resources, floodplains, and hazardous materials.

Air Quality

Air quality legislation and regulations will need to be considered throughout the planning and development process for the Development Plan and AWI Vision for the Southwest. The most important regulation to consider is the 1970 Clean Air Act (CAA), as amended in 1977 and 1990. The CAA has established criteria air pollutants, which are standardized and are used to determine geographical areas that are considered to be either in attainment or non-attainment for the criteria air pollutants. The United States Environmental Protection Agency (USEPA) established air quality standards, known as the National Ambient Air Quality Standards (NAAQS), for six criteria air pollutants: carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), inhalable

particulate matter (PM₁₀ and PM_{2.5}), and lead (Pb). The District of Columbia is in an area that the USEPA has currently designated as in serious non-attainment for ozone; however, the District of Columbia is in attainment for the remaining NAAQS. Ozone is principally formed from nitrogen oxides (NO_x), and volatile organic compounds (VOC) through chemical reactions in the atmosphere. Therefore, sources of NO_x and VOCs are subject to emissions limitations.

The CAA requires each state to submit a State Implementation Plan (SIP) that describes how the state will attain and maintain NAAQS in non attainment areas. The Metropolitan Washington Council of Governments has prepared a SIP for the District of Columbia Department of Health, as well as Maryland Department of the Environment, and the Virginia Department of Environmental Quality on behalf of the Metropolitan Washington Air Quality Committee (MWAQC). The SIP for the District of Columbia requires development projects above a minimum size and scale to secure construction or operating permits for sources of NO_x and VOCs.

The 1990 amendments to the Clean Air Act (CAA) also require federal agencies to conform to State Implementation Plans (SIPs) in non-attainment areas. Federal agencies are required to determine if proposed actions conform to the applicable SIP, through a conformity determination. Conformity may also impose emission control requirements on federal project components.

Geology & Soils

The District of Columbia is separated by a fall line into two physiographical provinces: the Piedmont Physiographical Province and the Coastal Plain Physiographical Province. The Southwest Waterfront is located within the Coastal Plain Physiographical Province, which is situated on alluvium and artificial fill. The depth of crystalline rock is between 250-300 feet.

There are two principle types of soil associations occurring along the Southwest Waterfront: Udorthents (U1) and Urban Land (Ub) (Figure 7.D1). Udorthents are comprised of very heterogeneous earth fill material that has been deposited on poorly drained to somewhat excessively drained soils. Udorthents are composed of approximately



FIGURE 7.D1
Existing Soils Types Map

80 percent earthy material and 20 percent other matter which may include bricks, trash, wire, metal, boards, cinders, industrial wastes, incinerator ash, and pieces of concrete and stone. The fill is a mixture of organic and inorganic waste materials, as well as sandy, gravelly, clayey, silty, and micaceous soil materials. The thickness of the fill is variable, but it is more than 20 inches. Permeability, available water capacity, runoff and internal drainage are quite variable. Most areas of this unit are subject to subsidence and, therefore, have poor potential for use as building sites. The Urban Land mapping unit consists of areas where more than 80 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. This mapping unit includes large areas of mostly miscellaneous artificial fill, often placed over streams, swamps, floodplains, and tidal marshes (Soil Conservation Service, 1976).



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Wildlife Resources

The fauna are characteristic of wildlife found in an urban setting, including squirrels, chipmunks, and songbirds such as robins, mockingbirds, and house sparrows. Large waterfowl (ducks, geese), raptors (hawks, eagles) or shorebirds (terns, gulls) occasionally use the open water of the Washington Channel for nesting or feeding.

Water Quality & Aquatic Resources

The Southwest Waterfront is located along the Washington Channel, which is connected to the Anacostia River near its confluence with the Potomac River. Both waterways are significant to the region for commerce and recreation. Washington Channel is an estuary that is approximately 0.30 square miles and is located between the District of Columbia's Southwest Waterfront and Hains Point. The Tidal Basin, located at the north end of the Washington Channel, is connected to the Washington Channel by tidal gates that are maintained and operated by the U.S. Army Corps of Engineers (USACE).

The uses supported by the Washington Channel's water quality are shown in Table D1. Although quality is relatively good compared to the Anacostia River in general, some uses are not supported. Several storm sewers emptying into the Channel are suspected of contributing to the pollution. Boats moored at local marinas are also suspected contributing sources of pollution. Primary contact recreation is the Channel is not supported, due to high fecal coliform bacteria levels. Based on a public health advisory issued on November 15, 1994 by the District's Commissioner of Public Health which still stands, the Washington Channel water quality also does not support fish consumption. This advisory urges non-consumption of catfish, carp or eel and limited consumption of other fish caught in any District waters (District of Columbia, 2000).

The restriction on fish consumption notwithstanding, many people do fish on both the western and eastern side of the channel. The Washington Channel has been classified with the designation of partially supporting aquatic life, which means that the biological condition of the channel has slight to moderate impairments (DHCD, 2000a). Fishing in the channel is mostly for sport; however some people do fish for consumption. Alewife, white perch and gizzard are

abundant in the Channel during migration, and pumpkinseed and bluegill are abundant resident fish.

Aerial surveys of submerged aquatic vegetation (SAV) in 1998 indicated three SAV beds in the Washington Channel. One SAV bed is located on the eastern side of the Washington Channel, approximately 1,200 meters south of the Interstate 395 Bridge. This bed is dominated by hydrilla and wild celery. A second SAV bed, located on the western side of the Washington Channel, approximately 800 meters south of the Interstate 395 Bridge, is dominated by Eurasian watermilfoil. The third SAV bed is on the western side of the Washington Channel, approximately 1,800 meters south of the Interstate 395 Bridge, and is dominated by wild celery. Of the three SAV species in the Washington Channel, only wild celery is native to the area; Hydrilla and Eurasian watermilfoil are non-native invasive species.

Floodplains

Portions of the project area lie within the 100- and 500-year floodplain (Figure 7.D2). The entire shoreline of the project area, with the exception of a small portion adjacent to the Washington Marina, is within the Federal Emergency Management Agency (FEMA) Zone A12. This zone is defined as being within the 100-year floodplain with a base flood elevation (BFE) of 12 feet (FEMA, 1985). All existing structures adjacent to the promenade are constructed above the 12 feet BFE. All of these structures have underground parking below the upper promenade that was designed to allow flooding.

TABLE D1
Washington Channel Use Support Status

CLASS OF WATER	CLASSIFICATION
Primary contact recreation	Not Supporting
Secondary contact recreation and aesthetic enjoyment	Fully Supporting
Protection & propagation of fish, shellfish and wildlife	Partially Supporting
Protection of human health related to consumption of fish and shellfish	Not Supporting
Navigation	Fully Supporting

Source: District of Columbia, 2000

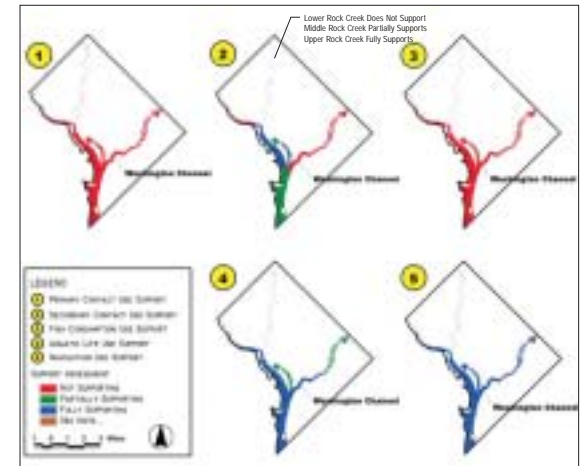


FIGURE 7.D2
Existing Water Quality and Aquatic Resources Map



FIGURE 7.D3
Existing 100-year and 500-year Floodplain Map



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Hazardous Materials

A search was conducted of available environmental records pertaining to hazardous substances and petroleum within the boundary of the Anacostia Waterfront Initiative, including the Southwest Waterfront project area (EDR, 2001). Supplemental inquiries were made to determine any undisclosed locations or issues with regard to hazardous material. The environmental records listed 14 sites, including 9 underground storage tanks (USTs), 4 Emergency Response Notification System (ERNS) sites, and 1 Resource Conservation and Recovery Information System (RCRIS) Site. No additional sites were disclosed from the interviews.

USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and, depending on the size of the tank and the facility owning the tank, must be registered with the D.C. Department of Health, Environmental Health Administration. Table D2 lists all of the USTs located in the projected area. None of the USTs have been listed as leaking underground storage tanks (LUST).

The ERNS database is a federal database containing information regarding reported releases of petroleum products and/or hazardous substances. The ERNS database integrates initial notification information of releases with follow-up information on the spill incidents. Reported spills incidents inside the project area included four notifications as indicated in the EDR report (Table D3).

The RCRIS database includes selective information on sites that generate, transport, store, treat and/or dispose of hazardous waste as defined by RCRA. Inclusion of a site on the RCRIS generator database does not necessarily indicate environmental problems. It does indicate that the listed facility is, or was, engaged in hazardous waste handling activities as defined by the Resource Conservation and Recovery Act (RCRA). An EDR database search indicated there is only one RCRIS site. This is a small quantity generator owned by the District's Metropolitan Police Department, located at 550 Water Street, SW 20024

TABLE D2
UST's in Southwest Waterfront Project Area

OWNER	ADDRESS	FACILITY ID
Washington Marina	1020 Maine Avenue	2-002688
Adkins Limited Partnership	1000 7th Street	2-003717
DCRLA	7th and Water Streets	0-000284
30/60 M St. Limited Partnership	903 Maine Avenue	2-004150
30/60 M St. Limited Partnership	915 Maine Avenue	2-004149
30/60 M St. Limited Partnership	951 Maine Avenue	2-004151
Metropolitan Police Department	550 Water Street	2-000046
Unknown	930 G Street	2-001145
Unknown	807 Maine Avenue	2-004153

Source: EDR, 2001

TABLE D3
ERNS Sites in Southwest Waterfront Project Area

700 Block of Water Street
600 M Street
600 M Street
Harbor Patrol Pier 4 Area, 600 Water Street
915 Maine Avenue

Source: EDR, 2001



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Physical Infrastructure - Utilities

Investigating the existing infrastructure conditions in the Southwest Waterfront project area require coordination and consultation with the Potomac Electrical Power Company (PEPCO), Water and Sewer Authority (WASA), and Washington Gas. The following is a summation of the existing conditions information that was collected through the consultation efforts.

Stormwater

Stormwater collection in the project area is provided by an underground stormwater system that is maintained by WASA. The stormwater and wastewater conveyance systems for the project area are separated. Most of the infrastructure in the project area ranges from 20 to 30 years in age and is in good condition.

The stormwater infrastructure consists of a network of underground piping, ranging from 15 to 108 inches, and drop inlets. There are seven major stormwater interceptor lines, ranging from 36 to 108 inches (Figure 7.D3) that terminate (outfall) into the Washington Channel by bisecting Maine Avenue and Water Street. Only street stormwater piping and branch lines that are connected to drop inlets run under Maine Avenue and Water Street. The interceptor lines run beneath the Interstate 395 Bridge, directly north of the Municipal Fish Market, along 9th Street, 7th Street, L Street, and under 6th Street to the Municipal Pier (Figure 7.D4).

In addition to the seven interceptor outfalls, there are an additional 9 outfalls located on the bulkhead of the Southwest Waterfront. These 9 outfalls range from 24 to 30 inches and collect local stormwater from the promenade and adjacent structures. The combination of all 16 outfalls collects stormwater from a storm drainage basin consisting of an area of approximately 440 acres. This drainage basin extends west to 14th Street, north to Independence Avenue with portions of the National Mall, east to 3rd Street, and south to P Street. Of the 16 outfalls, only 12 run directly underneath the promenade. The remaining four discharge north of the promenade at the Municipal Fish Market and the Washington Marina. Six of the 12 outfalls are major stormwater interceptor lines, ranging from 36 to 108 inches that bisect not only the promenade, but also Maine Avenue and Water Street. The remaining six outfalls range from 24 to 30 inches and collect local stormwater from the promenade and adjacent structures.



FIGURE 7.D4
Large Stormwater Outfall in the Southwest Bulkhead



FIGURE 7.D5
Existing Stormwater Infrastructure Map



FIGURE 7.D6
Existing Stormwater Watershed Map



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Sanitary Sewer

Wastewater collection and treatment services are provided to the project area by WASA. Although much of the wastewater collection in the District of Columbia is within a combined sewer and stormwater system (CSS), the Southwest Waterfront area's wastewater collection and stormwater collection systems were separated during the redevelopment of the Southwest Waterfront in the late 1960s and early 1970s. At present, there is a 36-inch trunk line under the northern portion of Maine Avenue that conveys wastewater from Southwest Waterfront to the Main Sewerage Pumping Station located near the Navy Yard. Wastewater generated from within the project area is collected within smaller diameter 10-inch and 12-inch gravity sewers, which are located within Water Street. These lines discharge wastewater to the 36-inch trunk line at points near the intersections of Maine Avenue and 9th Street, 7th Street, L Street, and 6th Street (Figure 7.D5).

Potable Water

The project area is currently served by city water provided by WASA. The primary service to the project area is a 20-inch distribution main, which was constructed in January of 1968. This water main runs close to the centerline of Maine Avenue. The 20-inch distribution main originates from a 20-inch line in Independence Avenue and continues under Maine Avenue to M Street Boulevard, where it eventually connects to a 30-inch line (Figure 7.D6).

An 8-inch service line is connected to the 20-inch main at five locations throughout the project area. The connection points coincide with the Municipal Fish Market, 9th Street, 7th Street, and 6th Street. The 8-inch service main is located under Water Street and extends from the Fish Market to a terminus point at Pier 5, the Municipal Pier (i.e., Fire and Police Pier).

Natural gas

Natural gas is provided to the project area through lines owned and operated by Washington Gas. A natural gas service line ranging from 4 to 8 inches runs under the west side of Water Street from the Municipal Fish Market to the Municipal Pier. This service line is connected to two main gas lines throughout the project area. An 8-inch main natural gas line runs along the south and southeast shoulder of 7th Street and connects to the Water Street service line.



FIGURE 7.D7
Existing Sanitary Sewer Infrastructure Map

The other main natural gas line, a 6-inch line, runs under 6th Street and also connects to the Water Street service line (Figure 7.D7). The natural gas infrastructure in the Southwest Waterfront project area ranges from 10 to 25 years in age and is in good condition (Per. Comm., Sansing, 2002).

Electrical

The project area is currently provided with electrical power through an electrical distribution system owned and maintained by Potomac Electric Power Company (PEPCO). The primary electrical system in the project area is provided from a small 4 kilovolt (kV) substation, via 4kV underground feeders, routed under Water Street. From this main feeder, services are being provided to individual buildings and structures throughout the project area. Based on correspondence with PEPCO, there is also very limited 13kV feeder capacity in the project area.



FIGURE 7.D8
Existing Potable Water Infrastructure Map



FIGURE 7.D9
Existing Natural Gas Infrastructure Map



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Physical Infrastructure - Maritime Structures

The scope of inspection of the bulkhead and pier structures included a visual examination of exposed elements and interviews with the marina's dock manager / dock master. Accessible elements of the bulkhead, promenade and piers included piles, caps, deck, elements, and concrete retaining wall (above the waterline). Interviews and marina tours were completed for the Gangplank Marina and the Capitol Yacht Club. Information regarding the Washington Marina was obtained from USACE, Baltimore District; the document: Inspection of Waterfront Facilities at the Southwest Waterfront Development Site and the Southwest Waterfront Improvement Project Environmental Assessment prepared for the District of Columbia's Department of Housing and Community Development (DHCD). A summary of the bulkhead along the Southwest Waterfront and pier structures at the Washington Marina, Capitol Yacht Club, and Gangplank Marina is provided below. Potential redevelopment limitations as a result of the existing maritime structures are discussed under Environmental Constraints.

Washington Channel

The Washington Channel, approximately 9,600 feet in length and 850 feet in width, covers roughly 0.30 square miles of surface. The actual ship channel is located roughly 50 feet from the pierhead line, which projects 272 feet from the Southwest Waterfront promenade (Figure 7.D8). Channel dimensions are 24 feet deep and 400 feet wide, except under the Interstate 395 Bridge, where the channel narrows into the Tidal Basin outlet gates. Maintenance of the ship channel and the Tidal Basin outlet gates is performed by the USACE. The Washington Channel has an average tidal range of 2.9 feet, an irregular tidal range of 4.5 feet and an extreme tidal range of approximately 10.7 feet (USACE, 2002).

Overnight and day anchoring during the summer months in the ship channel is a popular choice among boaters. Currently, there are no regulations that limit the use or location for ship channel anchoring. However, the Washington Channel is a "No Wake/6mph Zone." This regulation is enforced for safety reasons and due to the location of the marinas in the channel.

Bulkhead & Promenade

A visual assessment of above waterline bulkhead elements was completed from the Washington Marina to the promenade south of the Municipal Pier. Multiple attempts were made to obtain as-built drawings for the bulkhead; however, copies could not be located. Without as-built drawings, the loading capacity of the bulkhead could not be determined.

Based upon the USACE condition assessment of the bulkhead along the Washington Marina to the Municipal Fish Market Piers, built circa 1940 and supported on timber piles, is in good structural condition. The timber piles supporting the bulkhead were pick penetrated and core sampled and also found to be in good condition. The concrete bulkhead does exhibit isolated vertical cracks due to creep and sinkage; however, these cracks do not appear to pose any adverse effects to the structural integrity of the bulkhead (USACE, 2001).

The northwestern end of the bulkhead, located under the I-395 Bridge, is much lower than the finished ground (Figure 7.D9). The reason for the drop in bulkhead elevation is not obvious. Two possible explanations include: (1) the finished ground or road located behind was raised after the construction of the bulkhead and/or (2) sinking/settling of the bulkhead foundation occurred (though no vertical cracks in the bulkhead were observed). This section of the bulkhead should be improved in the near future. Suggested improvement includes raising the top of the bulkhead to match the ground grading or paving. A bulkhead foundation condition assessment is recommended prior to any improvement work.

Bulkheads located at the Municipal Fish Market could not be visually inspected due to the presence of the fish market barges directly along the bulkhead. However, the USACE condition assessment indicated that the bulkhead surrounding the Municipal Fish Market is in good condition and the timber piles supporting the bulkhead and platform should last for another 30 years, assuming no significant change to local water conditions and elevation (USACE, 2001).



FIGURE 7.D10
Existing Location of 272' Pier Line and Ship Channel



FIGURE 7.D11
Existing Bulkhead underneath the Interstate 395 Bridge



The bulkhead that stretches from the Capitol Yacht Club to the Municipal Pier was constructed circa 1975. The design of this bulkhead consists of timber piles supporting a concrete bulkhead wall. Random creep and shrinkage cracks were observed at the top and face of the bulkhead during visual inspection. These cracks do not pose any adverse structural effect, but it is recommended that they be sealed against corrosion of reinforcement. The bulkhead is in plumb position and shows no signs of leaning. The bulkhead currently supports a 12-foot wide promenade with aggregate finish and foundation soils, and there is no sign of settlement (Figure 7.D10). The promenade's condition is good with only a few surface cracks.

Timber decks on timber piles also support the bulkhead south of the Municipal Pier. This bulkhead is in good condition, but the park's promenade has multiple uneven surfaces due to the settlement of foundation soils.

Based on visual observations, the overall conditions of the bulkheads within the Southwest Waterfront project area are in good condition. Timber piles with timber decking support all bulkheads. The conditions of the underwater timber structure cannot be verified. Therefore, it is recommended that the timber foundation systems be investigated prior to any long-term development.

Washington Marina

The Washington marina property is owned by the federal government, but is under exclusive control of the DHCD. The Washington Marina operates a small boat berthing, repair, and sales operation. The timber pier structures at the Washington Marina were built in the 1930s. Under the guidance of the USACE, the DHCD has removed all existing piles (approximately 340) and timber piers (approximately 22,000 square feet), and replaced them with floating piers. The majority of this work has been completed, and Washington Marina currently has 91 new boat slips.

Municipal Fish Market

The Municipal Fish Market is at the northern end of the project area, directly to the south of I-395. It consists of the Fish Cleaning Building, a parking area, and concrete piers and bulkhead. There are two 6,800 square foot piers in the Municipal Fish Market area, which are old and in disrepair. Seafood vendors operate on floating barges along the piers. The wood foundations for the piers have not been examined.

Renovation of the Municipal Fish Market is being completed simultaneously with the repair and upgrade of the Washington Marina. Proposed renovation work at the market includes: renovation of the fish cutting house, demolition of the Maine Avenue Seafood building; construction of new public restrooms; repavement and reconfiguration of parking lots; repavement of concrete piers; upgrade of walkways; replacement of railings; removal of underground storage tanks; repair of a section of the concrete bulkhead; upgrade and relocation of utilities; and upgrade of site lighting.

Capitol Yacht Club

The Capitol Yacht Club is located south of the Municipal Fish Market and along the west façade of Philips Flagship Restaurant stretching south to the termination of 9th Street. The Capitol Yacht Club operates and maintains four piers that span 272 feet into the Washington Channel from the promenade. The Yacht Club is capable of mooring 88 boats ranging from 20 to 45 feet. Two of the four piers are floating structures, whereas the remaining two are fixed timber piers. The fixed timber structures are located at opposite ends of the marina (south of the Municipal Fish Market and at the termination of 9th Street), and the floating piers are situated in front of the Philips Flagship Restaurant.

All four piers were built circa 1980 after the completion of the Washington Metro's Yellow line underground crossing of the Washington Channel. The Metro's Yellow line crosses approximately 60 feet below the bottom of the Channel, which is directly below the location of the two floating piers. The decision by the Capitol Yacht Club to install the pre-fabricated floating piers was the result of consultation with Metro.



FIGURE 7.D12
Existing Waterfront Promenade



FIGURE 7.D13
Timber Pier at Capitol Yacht Club



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The floating piers, covered with timber decking, are metal structures supported by plastic bladders and guided by metal pilings during tidal changes. This type of pier construction has a life expectancy of approximately 30 years. The floating piers are approximately 22 years old and in good operating condition. They are expected to last beyond the typical pier life expectancy of 30 years. Furthermore, all piers are well maintained and utility upgrades/replacement have been conducted on an as-needed basis since original construction.

The fixed timber piers were designed and constructed by the USACE and consist of 10-inch to 16-inch timber pilings with 2-inch thick timber decking. These fixed piers are in very good operating condition and show no signs of aging.

All four piers terminate with a "T" structure in the Washington Channel, each of which is capable of mooring large vessels up to 220 feet. The four piers are provided with electrical power that includes 30- and 50-amp service for all slips and three-phase 100-amp service on the "T" of each pier. Other utilities provided to each slip include: cable television, telephone service, and potable water service. There are four sanitary wastewater pump out stations located on each pier. Sanitary wastewater from the pump out stations is conveyed through polyvinyl chloride (PVC) piping that is connected to the District of Columbia's sanitary wastewater distribution system. All utilities are currently capable of fully serving the marina, with the exception of electrical service. Onshore facilities at the Capitol Yacht Club include bathrooms, a restaurant and bar, Yacht Club offices, a utility shed, and approximately 100 parking spaces (Per. Comm., Lee, 2002).

Gangplank Marina/Odyssey Pier

The Gangplank Marina is the largest marina in the Washington Channel; capable of mooring 306 vessels ranging from 20 to 80-feet in length. The marina stretches approximately 1,900 feet along the waterfront from the intersection of 9th Street and Water Street to the intersection of 6th Street and Water Street. The marina is owned by the National Capitol Revitalization Corporation (NCRC) and operated under contract with Coastal Properties Management, Inc. of Annapolis, Maryland.

The Odyssey Cruise Ship has administrative offices on the old Harbor Police Pier. This large fixed timber and concrete pier, constructed circa 1930, is approximately 60 feet wide and 200 feet long. Since its original construction, two floating piers, part of the Gangplank Marina, have been added circa 1975. These floating piers protrude from the end and north side of the pier. The south side is used for mooring the Odyssey Cruise Ships. In March 2003, a new Cajun/Tex-Mex restaurant, Cantina Marina, will open on the pier.

Conditions of the old Harbor Police pier and its additions were investigated through a visual assessment and interview/tour with Dock Manager David Titus. According to Mr. Titus, the floating piers and above water elements are in good operating condition; however, the underwater structures (e.g., timber piles) are showing signs of deterioration. Currently, a conditions assessment of the old Harbor Patrol pier and Gangplank's other floating piers is being conducted (Per. Comm., Titus, 2001).

In addition to the old Harbor Patrol pier, the Gangplank Marina operates 10 other floating piers located north of the old Harbor Patrol pier. All 10 of the floating piers were constructed circa 1975 and consist of two prefabricated types. The existing floating piers are in good condition, but foam flotation devices are deteriorating and need to be replaced. All piers are well-maintained and utility upgrades or replacements have occurred multiple times since their original construction. Access to the 10 piers is obtained at two locations - one located 280 feet north of the old Harbor Patrol Pier, and the other located off the promenade in front of the Zanzibar night club (approximately 850 feet north of the old Harbor Patrol pier).

A dock office that is supported by a fixed timber structure controls the access point near to the old Harbor Patrol pier, using an electronic controlled or keyed gate (Figure 7.D12). The timber structure dock office was built circa 1975 and is in good condition. The deck of the dock office leads to a floating pier that runs parallel and 6-feet away from the bulkhead. Administrative offices for the Gangplank Marina are located on a floating office barge adjacent to the dock office.

All 10 piers, except the pier furthest north, terminate with "T" structures that are capable of mooring larger vessels. All piers are provided with electrical power that includes 50-amp service for all slips. Other utilities to each slip include: cable television, telephone service, and potable water service. There are multiple sanitary wastewater pump out stations located on each pier that convey wastewater to the District's sanitary wastewater distribution system. All utilities are currently capable of fully serving the marina. Other facilities at the Gangplank Marina include shower and laundry facilities, a utility shed, and approximately 240 parking spaces that are shared with the Odyssey Cruise Ship operation. There are 100 live-aboard vessels with roughly 200 residents (Per. Comm., Titus, 2002).

Spirit Pier

The Spirit Pier and the building on it were built circa 1945. Neither the building nor the pier is listed on the National Register of Historic Places, however, structures over 50 years old such as these often qualify for the National Register. The Spirit Pier is used exclusively by the Spirit Cruise operation, which docks three large boats on the pier. The Spirit Cruise boats can hold a total of 975 passengers (including a 600 passenger vessel, a 300 passenger vessel, and a 75 passenger vessel). The parking lot adjacent to the Spirit Pier accommodates approximately 200-225 cars.



FIGURE 7.D14
View of Gangplank Marina's Dock House



Southwest Waterfront Development Plan

Environmental Constraints

There are a number of environmental issues that may have relevance to future development in the Southwest Waterfront. The Southwest Waterfront planning team did an evaluation of the environmental resources that were presented in the above discussion of the existing conditions. The following table (Table D4) provides a summary of the potential for redevelopment limitation as a result of the existing conditions.

Air Quality

There is a low potential for redevelopment limitations due to air quality issues in the Southwest Waterfront. The only air quality standard that the District of Columbia is considered non-attainment for is ozone, which is the principal component of smog. The source of ozone is chemical reaction between two pollutants, volatile organic compounds (VOCs) and nitrogen dioxides (NO₂). VOCs are released from burning fuel (gasoline, oil, wood coal, natural gas, etc.), solvents, paints, glues and other products used at work or at home. Nitrogen oxides are also produced from burning fuels and are also a major component of acid rain. Automobiles are an important source of VOCs and NO₂. Health effects resulting from high ozone levels include breathing problems, reduced lung functions, asthma, irritated eyes, stuffy nose, reduced resistance to colds and other infections, and an acceleration of lung tissue growth. Ozone can also impact the environment by damaging trees and plants and reducing visibility.

As a result of the proposed development, the amount of vehicle trips will increase to and from the Southwest Waterfront. Since automobiles are considered the main source of VOCs and NO₂, the proposed development could impact air quality, especially with regards to ozone. One possible mitigation strategy to reduce air quality impacts is to increase public transportation opportunities in the Southwest Waterfront area.

TABLE D4
Summary of Potential Redevelopment Limitations: Environmental

ENVIRONMENTAL RESOURCE	POTENTIAL LIMITATIONS ON REDEVELOPMENT	SUMMARY
Air Quality	Low	Washington D.C. is in a non-attainment area for ozone: sources of nitrogen dioxide and volatile organic compounds will likely require permits to limit emissions to conform to DC implementation plan
Geology & Soils	Moderate	Uncontrolled fill in the project area could result in differential settling, variability in bearing capacities and unstable conditions for the placement of foundations and other structures. Onsite soil characterization will be necessary to determine the exact development constraints and/or geotechnical engineering requirements.
Wildlife Resources	None	Existing wildlife is typical of an urban setting (e.g., squirrels and sparrows). The increase in vegetation or landscaping proposed by the redevelopment will increase the existing wildlife habitat.
Water Quality & Aquatic Resources	Low	The channel does not support primary contact recreation or fish consumption. Aquatic resources are limited to a few fish species and three sub aquatic vegetation (SAV) areas. Implementation of BMPs/LID during construction and operation of project area would decrease potential for adverse impacts to the Channel.
Floodplains	Moderate	Majority of the waterfront is located within the 100-year floodplain with Base Flood Elevations of 12 feet. The lowest floor in a residential building that is located in the 100-year floodplain must be flood-proofed to 13.5 feet to adhere to the DC's Regulations.
Hazardous Materials	Low	Although standard data sources list sites that generate or store hazardous substances or petroleum products, these are not expected to limit the redevelopment process. An environmental site assessment under the American Society for Testing and Materials (ASTM) Designation E 1527-00 should be conducted as property is acquired to exercise due diligence under CERCLA.

To regulate the emission levels resulting from the proposed development, projects located in non-attainment areas are required to demonstrate compliance with the General Conformity guidelines established in 40 CFR Part 93, Determining Conformity of Federal Actions to State or Federal Implementation Plans ("the Rule"). Since the redevelopment project is located within an area designated by the EPA as a serious ozone non-attainment area, a General Conformity Rule applicability analysis would be typically warranted.

Geology & Soils

Due to the disturbed nature of soils in the project area and the presence of uncontrolled fill, determination of specific uses and limitations of the soils and potential geo-technical constraints associated with development on the soils is not possible based on available information. The presence of uncontrolled fill in the project area could result in differential settling, variability in bearing capacities, and unstable conditions for the placement of foundations and other structures. As a result the potential for redevelopment limitations with regards to geology and soils would be considered moderate. Onsite characterization of soil conditions by completing soil borings will be necessary to determine the exact development constraints and/or geo-technical engineering requirements necessary to overcome the constraints.

**Wildlife Resources**

Some wildlife species may be disturbed by construction activities for the redevelopment process and by increase human activity along the Washington Channel; however, the Southwest Waterfront currently provides limited wildlife habitat. Therefore, there is no potential for development limitation with regards to wildlife resources in the project area. In fact, beneficial impacts could occur as a result of an increase in vegetation due to landscaping and the addition of open and park space. Increase in vegetation would improve habitat for the existing urban wildlife at the Southwest Waterfront.

Water Quality & Aquatic Resources

The potential for limitations or constraints to the redevelopment process in the Southwest Waterfront area with regards to aquatic resources is considered low. However, large-scale waterfront construction would require the implementation of best management practices (BMPs) to protect the aquatic resources and maintain current water quality located in the Washington Channel. In addition, the redevelopment of the Southwest Waterfront is an opportunity to improve water quality by the use of low impact development (LID) techniques to manage the quantity and quality of stormwater runoff.

LID is an innovative stormwater management approach with a basic principle that is modeled after nature: manage rainfall at the source using uniformly distributed decentralized micro-scale controls. LID's goal is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. LID addresses stormwater through small, cost-effective landscape features located at the lot level. These landscape features, known as Integrated Management Practices (IMPs), are the building blocks of LID. Almost all components of the urban environment have the potential to serve as an IMP. This includes open space, but also rooftops, streetscapes, parking lots, sidewalks, and medians. LID is a versatile approach that can be applied to new development, urban retrofits, and redevelopment/revitalization projects. Examples of implementable LIDs include: roof gardens, bio-retention swales, semi-impermeable surfaces, and rain barrels.

Floodplains

The majority of the Waterfront is located within the 100-year floodplain with a BFE of 12 feet. As a result, the potential of redevelopment limitation due to the location of the floodplain is considered moderate. Any redevelopment in the project area will need to comply with District's Flood Hazard Rules. Specifically, the lowest inhabited floor of any redevelopment will need to be constructed 1.5 feet above the BFE, a total of 13.5 feet. However, if the lowest floor of redevelopment is non-residential and not elevated in accordance to the BFE; the structure must be designed and constructed to be completely or essentially dry in accordance with the standards contained in the publication entitled Flood-Proofing Regulations and written by the USACE.

Hazardous Materials

Findings in the EDR report, in combination with the interviews, do not indicate any major constraints to redevelopment in the Southwest Waterfront project area with respect to hazardous materials or petroleum. There are no known hazardous material remediation projects currently in progress, planned, or needed in the project area. The potential for redevelopment limitation as a result of hazardous materials is considered low to moderate.

However, to determine the exact potential for redevelopment limitation, it is recommended that an Environmental Site Assessment (ESA) under ASTM Designation E 1527-00 be completed to qualify for the innocent landowner defense to liability under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). A Phase I ESA, a standard report, is a due diligence process that will investigate the environmental characteristics of a parcel of commercial real estate or other conditions, usually in connection with a commercial real estate transaction. Completion of a Phase I ESA will identify any recognized environmental conditions (RECs). A REC is defined as the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property. Identification of an REC would then lead to additional actions to address the REC.



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Physical Infrastructure - Utility Constraints

Increases in commercial, hotel, and residential land uses will increase utility demands in the project area and could impact the capacity of existing utilities. Consultation with both WASA and Washington Gas representatives have indicated that capacity issues should not be a problem due to the size, age and condition of the existing infrastructure. However, further coordination and consultation with both WASA and Washington Gas should continue upon the approval of a proposed redevelopment plan. Table D5 summarizes findings of the consultation with the utility companies and the information to be presented in this section.

Sanitary Sewer

Based upon conversations with WASA, the wastewater conveyance system in the project area is in relatively good condition, and it is not anticipated that the primary service line would need to be replaced or upgraded. As a result, potential redevelopment limitations by the sanitary system is considered low. However, as the Southwest Waterfront project progresses, capacity modeling performed by WASA will need to be completed (Per. Comm., Reggis, 2002). In order for WASA to complete the capacity modeling for wastewater, the following two items of information will need to be provided: (1) average GPD and (2) maximum GPD.

Wastewater flows from the proposed development are estimated to average 231,210 GPD, based on 85 percent of the average potable water demand (272,015 GPD). Note that this number does not account for sanitary sewer discharge from the Waterfront marinas. Daily peak factors as high as four times the average flow should be considered to account for diurnal peaks in wastewater discharge as wastewater collection systems (pipes, pump stations, screens) are typically designed with to accommodate instances of simultaneous water use and other infrequent conditions of peak flow.

Applying this peaking factor to the estimated wastewater flow rates provides approximate peak wastewater flow rates expected in the system. Table D6 summarizes the anticipated wastewater flow rates from each of the development sites.

TABLE D5 Summary of Potential Redevelopment Limitations: Utilities		
ENVIRONMENTAL RESOURCE	POTENTIAL LIMITATIONS ON REDEVELOPMENT	SUMMARY
Stormwater	Low	Received verbal verification that the storm sewer infrastructure is in good condition. However, further coordination with WASA will be necessary as project progresses.
Sanitary Wastewater	Low	Received verbal verification that sanitary wastewater capacity in the project area is adequate and in good condition. However, further coordination with WASA will be necessary as project progresses. Sanitary sewer lines from Water Street would need to be relocated to Maine Avenue.
Potable Water	Low	Received verbal verification that potable water capacity in the project area is adequate and in good condition. However, further coordination with WASA will be necessary as project progresses. Potable water lines from Water Street would need to be relocated to Maine Avenue.
Natural Gas	Low	Received verbal verification that natural gas capacity in the project area is adequate. However, further coordination with Washington Gas will be necessary as project progresses. Natural gas lines from Water Street would need to be relocated to Maine Avenue.
Electrical	Low	Received written verification from PEPCO that their existing 13.2kV feeder capacity in the project area is limited. However, they are prepared to expand and extend the necessary infrastructure to support any projected developments in the area. Extensive coordination with PEPCO will be necessary as the project progresses.

TABLE D6 Wastewater Flow Rates (in gallons per day, GPD)					
SITE	COMMERC'L	HOTEL	RESIDENTIAL	TOTAL	PEAK
1	7,115	19,125	14,875	41,115	164,458
2	6,503	0	58,438	64,940	259,760
3	5,742	0	32,938	38,679	154,717
4	8,186	0	45,688	53,873	215,492
5	9,231	0	23,375	32,606	130,424
6	0	0	0	0	0
Total (GPD)				231,213	924,852

Source: The Louis Berger Group, Inc., 2002.

Using the maximum density redevelopment scenario for the Southwest Waterfront, approximately 231,213 GPD of wastewater would be conveyed from the project area. A peaking factor of four was applied and a maximum GPD of wastewater flow was calculated to be 924,852 GPD. Upon approval of the development plan, the estimated average and maximum wastewater GPD could be given to WASA to complete the capacity modeling.

Multiple abandoned sanitary sewer lines are scattered throughout the project area. This does not pose great constraints on the redevelopment efforts, but will need to be taken into consideration during any ground clearing or demolition activities. These abandoned sanitary sewer lines range from 8 to 16-inches in diameter.

Furthermore, the elimination of Water Street would require the abandonment of the existing 10-inch and 12-inch sanitary sewer collection lines in Water Street and their relocation in the southern paved portion of Maine Avenue. This relocated line would serve as the main sanitary sewer collection line for the properties from the Municipal Fish Wharf through Pier 5 and would serve each of the six-redevelopment sites. Approximately 3,300 linear feet of new 12-inch gravity sewer line would be required along with approximately 10 new sanitary manholes. The new sanitary sewer would connect to the 36-inch trunk line at the same locations as the existing connections. Additional connections may be required to accommodate sanitary sewer discharge from the proposed development sites, depending upon the proposed development of each location.



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Storm Sewer

Coordination with WASA indicated that storm sewer systems currently located along the Southwest Waterfront are in good condition and are considered to be adequate for conveying urban runoff from the current development along the Southwest Waterfront with no capacity issues. However, to accurately determine required stormwater capacity, WASA would need calculations for the peak stormwater runoff of the 2 and 15-year storms as a result of any proposed redevelopment schemes. Redevelopment plans would be expected to reduce peak runoff for these storms to the pristine condition (Per. Comm, Truong, 2002). To accomplish this, the use of LID/BMPs such as bio-retention, infiltration trenches, vegetative filter strips, and vegetated buffers, could be required to reduce runoff and provide water quality treatment. Future implementation of LIDs and the use of BMPs combined with the good condition of existing stormwater infrastructure; potential redevelopment limitations were considered low with regards to the existing storm sewer systems.

The District's Stormwater Management Regulation, 509 through 518 of District Law 5-188 of the District's Water Pollution Control Act of 1984, authorizes the District to ensure that BMPs are used, coordinated with a Stormwater Management Plan, to control runoff from new development and redevelopment projects that disturb an area of land greater than 5,000 square feet. Additionally, all land disturbing activities (greater than 50 square feet) are regulated under District Law 2-23, the District Erosion and Sedimentation Control Act of 1977 and District Law 10-166, the District Erosion and Sedimentation Control Amendment Act of 1994. Both of the above District Laws would apply to the Southwest Waterfront project area. The cost associated with the development and implementation of a Stormwater Management Plan and Erosion and Sedimentation Control Plan are typical costs that are factored into any large construction or redevelopment project. The redevelopment of the Southwest Waterfront is great opportunity to implement new technologies to reduce the amount of urban runoff and increase the quality of the urban runoff that is discharging into the Washington Channel.

Potable Water

Based upon conversations with WASA, the water supply and distribution lines in the project area were reconstructed during the redevelopment of the waterfront in the late 1960s and early 1970s. These lines are in relatively good condition, and it is not anticipated that the primary service line would have to be replaced due to the redevelopment. As a result, potential redevelopment limitations with regards to the potable water system are considered low.

WASA indicated that no pressure or flow data was available for the water distribution system in this area. This type of testing and other capacity modeling by WASA would be required as the Southwest Waterfront project progresses to determine exact line capacity (Per. Comm., Cochran, 2002). For WASA to determine potential capacity impacts, they requested the following information be provided upon final approval of the development plan: (1) average gallons per day (GPD); (2) maximum GPD; and (3) results of the hydrant flow testing.

Using Table D7: Typical Water Rates, the average GPD of potable water consumed by the proposed maximum redevelopment scheme was 272,015 GPD (Table D8). Demand values were determined for each of development sites based upon estimates for commercial square footage, number of hotel rooms and residential units at each site parcel. In order for WASA to determine potential capacity issues, additional information will need to be obtained: maximum GPD and hydrant flow testing results.

Multiple abandoned potable water lines are scattered beneath the project area. These do not pose constraints on the redevelopment efforts, but will need to be taken into consideration during any ground clearing or demolition activities. These abandoned potable water lines range from 8 to 16 inches in diameter.

Furthermore, the elimination of Water Street would require abandoning existing potable water service lines in Water Street and their relocation into the southern edge of Maine Avenue. The relocated potable water

TABLE D7
Typical Water Rates

USER	UNIT	FLOW RATE (gal/unit/day)
Office	Employee	15
Hotel	Guest	50
Restaurant	Customer	9
Shopping	Customer	10
Theater	Seat	3
Residential	Dwelling Unit	250

Source: Wastewater Engineering, Metcalf & Eddy 3rd Edition, 1991.

TABLE D8
Water Consumption Estimate for Development Plan (in gallons per day, GPD)

SITE	COMMERC'L	HOTEL	RESIDENTIAL	TOTAL
1	8,370	22,500	17,500	48,370
2	7,650	0	68,750	76,400
3	6,755	0	38,750	45,505
4	9,630	0	53,750	63,380
5	10,860	0	27,500	38,360
6	0	0	0	0
Total (GPD)				272,015

Source: The Louis Berger Group, Inc., 2002.

line would be the primary water supply service for the properties from the Municipal Fish Wharf through Pier 5 and would serve each of the six-redevelopment sites. To accommodate the proposed water and fire flow requirements for the proposed redevelopment, it is anticipated that the 8-inch service line would have to be increased to a 12-inch line to provide adequate flow rates during peak demand periods. Approximately 3,600 linear feet of new 12-inch potable water line would be required along with associated valves and hydrants in the southern edge of Maine Avenue.

***Natural gas***

Coordination with Washington Gas was conducted to determine the capacity and condition of natural gas system in the Southwest Waterfront area. The conditions of the natural gas lines are considered good due to their age (10-25 years old). Currently, there are no natural gas capacity issues within the Southwest Waterfront area. As a result it was determined that the natural gas system in the project area will not limit any type of redevelopment. However, continued coordination with Washington Gas should occur upon the approval of a proposed redevelopment scheme to resolve any future capacity issues or the relocation of natural gas lines.

There are multiple abandoned natural gas lines within the project area. This does not pose constraints on the redevelopment efforts, but will need to be taken into consideration during any ground clearing or demolition activities. These abandoned natural gas lines range from 2 to 10 inches in diameter.

Due to the closure of Water Street and an effort to loop the natural gas system along the Southwest waterfront it is recommended that 3,600 feet of 8-inch natural gas line be moved to Maine Avenue. Additionally, this relocation will require the installation of various service lines to the site parcels proposed in the redevelopment plan, which will be approximately 500 ft of various size lines.

Electric

Based on correspondence with PEPCO, the existing 4kV substation serving the project area is slated for conversion to 13kV between 2003 and 2009, with retirement of the substation by 2009. The plans to upgrade the PEPCO service lines in the project area provides an opportunity to relocate the lines from Water Street to Maine Avenue and increase the systems capacity if needed. However, to accomplish this there needs to be formal coordination with PEPCO, DCOP, and NCRC upon the approval of a final redevelopment scheme.

It is our understanding from correspondence with PEPCO that the existing 4kV system will be phased out in future years, with the expansion of their 13kV system into the project area. Although the proposed electrical system for the project area is not existing, PEPCO has provided written correspondence showing a commitment to expand and extend the necessary infrastructure to support any projected load developments in the project area. In order for PEPCO to adequately expand and extend their existing system, the following information with regards to the proposed redevelopment will need to be provided to PEPCO in a timely manner: (1) location of proposed development (2) type of development (i.e. building usage, etc.); and (3) associated electrical demands.

The elimination of Water Street would require the abandonment of the existing underground 4kV electrical system in Water Street and an installation of a new 13kV electrical system in Maine Avenue. This new electrical system would serve as the main electrical feed for the project area, and would serve each of the six-redevelopment sites. Approximately 3,600 linear feed of new underground concrete encased ductbank and electrical feeders, as well as new transformers would be required. Utility connections would be provided to each of the proposed development sites, based on the proposed development of each location. The majority of the design and construction required for new main feeder and utility service connections will be performed in conjunction with or by PEPCO, and substantial coordination with PEPCO will be required as the project progresses.



AWI Southwest Waterfront Vision

Preliminary Analysis of Bulkhead and Maritime Structures

The Southwest Waterfront Development Plan does not involve any alterations to the bulkhead or maritime structures along the waterfront. The AWI Southwest Waterfront Vision, however, includes recommendations that may impact the existing bulkhead and maritime structures, such as the creation of public piers, the relocation of the cruise ship operation, and the expansion of the Fish Market. Before any of these recommendations are undertaken, a much more rigorous analysis of the bulkhead and maritime structures along the waterfront will be necessary.

Washington Channel

The potential for redevelopment limitations as a result of the Washington Channel are considered low. For example, piers can only extend to a maximum of 272 feet from the bulkhead due to the location of the ship channel in the Washington Channel. Also, the "No Wake/6mph" zone could also have an adverse affect on the future use of water taxis for transportation of persons from the Southwest Waterfront to other waterfront destinations throughout the District of Columbia.

Bulkhead & Promenade

The bulkhead and its existing promenade will be transformed into a wider promenade to accommodate for more pedestrians and other various uses related to the proposed adjacent commercial activities (i.e., cafes, shops, etc.).

Based on visual observations, the overall conditions of the bulkheads and the promenade within the Southwest Waterfront project area are in good condition. As a result of the current condition of the bulkhead, it is anticipated that the potential for redevelopment limitation would be low with respect to expanding the existing promenade.

However, the loading capacity of the bulkhead to support an expansion of promenade cannot be verified due to availability of existing information. Therefore, it is recommended that the timber

TABLE D9 Summary of Potential Redevelopment Limitations: Bulkhead and Existing Structures		
	POTENTIAL LIMITATIONS ON REDEVELOPMENT	SUMMARY
Washington Channel	Low	The entire channel has and enforces "No Wake/6mph" zone; mooring in the middle of the channel is not restricted ; pier head line projects to a maximum of 272 feet; and the average tidal change is 2.9 feet.
Bulkhead & Promenade	Low	Based on visual inspection, the bulkhead appears to be in good condition; however, conditions of underwater timber decking and timber pilings could not be determined. Absence of as-built drawings prevented determination of structural load capacity.
Washington Marina	None	The marina consists of 65 various size boat slips; piers are in poor condition and are scheduled to be replaced. Several repairs and upgrades are planned to be performed on the Washington Marina in conjunction with the Municipal Fish Market
Municipal Fish Market	None	Several repairs and upgrades are planned to be performed on the Municipal Fish Market in conjunction with the Washington Marina.
Capitol Yacht Club	N/A	The Club consists of 88 boat slips, ranging from 20 to 45 feet. Both floating and fixed piers (total of 4) are in good condition. This marina is serviced by all utilities and has approximately 100 parking spaces. There are no live-aboards at this marina.
Gangplank Marina Materials	N/A	This marina consists of 306 boat slips, ranging from 20 to 80 feet. All floating piers (total of 10) are in good condition. This marina is serviced by all utilities and has approximately 40 parking spaces. There are 100 live-aboards (total of 200 persons) at this marina.
Spirit Pier	N/A	This pier services the Spirit Cruise operation, which includes three cruise boats: one 600 foot vessel, one 300 foot vessel, and one 75 foot vessel. The pier, over 55 years old, appears to be in good condition.

foundation systems of the bulkhead be investigated prior to any long-term development. Investigations should include underwater engineering studies.

Washington Marina

The renovation of the Washington Marina is currently in the planning process. As a result of the marina's location and its planned rehabilitation there are no anticipated redevelopment limitations with regards the proposed expansion of the promenade or any other proposed redevelopment elements.

Municipal Fish Market

The renovation of the Washington Marina also includes repairs and upgrades to the Municipal Fish Market. As a result of these extensive repairs and upgrades that are no anticipated proposed redevelopment limitations with regards to any of the proposed redevelopment elements.

Capitol Yacht Club

The Capitol Yacht Club consists of four piers that are capable of mooring a total of 88 boats ranging from 20 to 45 feet. These piers will need to maintain access from the expanded promenade and be equipped with the necessary utilities (sewage, water, and electricity).

Gangplank Marina/Odyssey Pier

The Gangplank Marina is the largest marina in the Washington Channel; capable of mooring 306 vessels ranging from 20 to 80 feet in length on their 10 piers. These piers will need to maintain access from the expanded promenade and be equipped with the necessary utilities (sewage, water, and electricity).

Spirit Pier

According to the Spirit Cruise operators, the Spirit Pier, which accommodates three large cruise ship vessels, is in good condition. Neither the Southwest Waterfront Development Plan nor the AWI Vision include any recommendations that will affect the Spirit Pier.